Louisiana Coastal Area (LCA), Louisiana

Ecosystem Restoration Study

July 2004

Draft

Appendix E – Plan Formulation

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LOUISIANA COASTAL AREA (LCA), LOUISIANA

ECOSYSTEM RESTORATION STUDY

APPENDIX E

PLAN FORMULATION

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1.1 Summary of Plan Formulation Phases and Development Methods

Each phase of the plan formulation process provided distinct results that were used to initiate the following phase. **Figure E-1** depicts the plan formulation phases and the development methods used to complete each phase and progress to the next one.

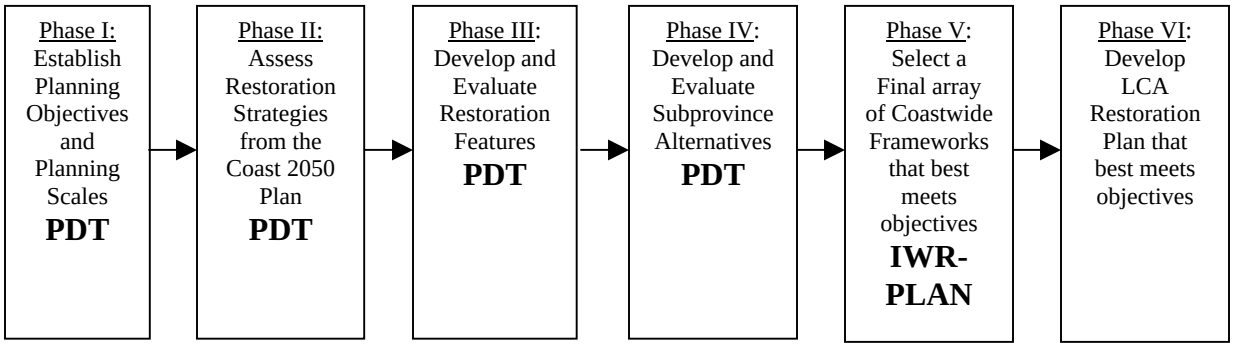

Figure E-1. Plan Formulation Phases and Development Methods.

The following information summarizes the development methods used for each plan formulation phase.

1.1.1 Establish Planning Objectives and Planning Scales (Phase I)

- Based on professional judgment and extensive experience in coastal Louisiana restoration, the Project Delivery Team (PDT) developed the Planning Objectives and the Planning Scales.
- The PDT established two "provinces," the Deltaic Plain and Chenier Plain. These were further divided into four functional ecological "subprovinces."

1.1.2 Assess Restoration Strategies from the Coast 2050 Plan (Phase II)

- The PDT, in conjunction with the Vertical Team (VT) and Framework Development Team (FDT), reviewed the Coast 2050 Plan and the Louisiana Coastal Area (LCA) Section 905(b) reconnaissance report. These efforts identified the following core strategies for coastal restoration.
    - To create and sustain wetlands through input and accumulation of sediment.
    - To maintain estuarine and wetland salinity gradients for habitat diversity.
    - To maintain ecosystem linkages for the exchange of organisms and system energy.

1.1.3 Develop and Evaluate Restoration Projects and Features (Phase III)

- The PDT developed restoration features for each of the subprovinces using professional judgment and extensive experience in coastal Louisiana restoration with the core strategies for coastal restoration as a guide.
- Sub-groups of the PDT developed restoration features to fit the strategic requirements of each subprovince. This phase identified a range of practical and accepted restoration features along with their characteristics. The PDT succeeded in developing and quantifying restoration features for coastwide restoration.
- Each feature was developed independently with preliminary costs and land-building or land-loss-modifying potential being estimated based on best available information and professional judgement.
- Potential restoration footprints for each feature were delineated and designers began to develop scaleable designs and cost estimates. In addition, for any features introducing additional water resources, the designers provided relative levels of freshwater introduction and land building for each level.
- Preliminary estimates of the ecological output of each feature (in acres created) were made. In addition to any available land-building estimates, the teams considered current land-loss rates within each footprint and estimated the degree that this might be reduced by the considered feature, allowing an estimate of acres protected.
- The team made initial assessments of the positive, negative, or neutral fit of the features to the major goals and objectives established for the study. This positive, negative, or neutral assessment was also made for each feature against a broad range of significant resources. These assessments were used to identify and screen any features that would not support the environmental goals of the study.

1.1.4 Develop and Evaluate Alternatives – Select a Final Array of Coastwide Frameworks (Phase IV)

- The assembly of frameworks using study criteria, best available information, and professional judgment was adopted as an acceptable method to combine features into subprovince alternatives.
- Utilizing ecological criteria previously established, these teams combined the restoration features into alternative frameworks capable of achieving the various identified restoration scales. Applying the ecological criteria and the projected output for each restoration feature, the alternative development teams developed several significantly different frameworks for each desired subprovince output level.
- The PDT used existing hydrodynamic and ecological models, as well as agency and academic expertise, on a select number of alternative frameworks in each subprovince to produce a base of information. Based on the combined effects of the individual features from the desktop-model output for each alternative, the PDT produced benefit assessments. These assessments were also completed for any discreet, combinable features. The effects of the alternative frameworks were documented using multiple ecological output metrics.
- With a "toolbox" of restoration features developed, and a range of quantitative scales for the study identified, the teams assembled a variety of alternative frameworks for meeting these scales at the subprovince level. Features were combined to form

alternative frameworks. As they worked through framework development, it became apparent that all of the prescribed scale levels could not be achieved for every subprovince.

1.1.5 Evaluation of Alternative Frameworks

The evaluation methodology for the alternative frameworks was developed to capture their systemic relationships and outputs on a subprovince-wide scale, and involved a multi-tiered modeling and data processing structure.

The PDT evaluated alternatives within the subprovinces with extensive academic and interagency support using three consecutive analytic processes: simulation models, desktop models, and restoration benefit calculation.

- Previously tested hydrodynamic simulation models existed within all the study subprovinces.
- Desktop models based on linked spreadsheets were developed for the subprovinces and projected land building, habitat switching, habitat use, and water quality.
- The benefit computation methodology utilized the output provided by the desktop models to estimate the ecological output of each framework.

1.1.6 Select Coastwide Framework Which Best Meets Objectives (Phase V)

- A number of restoration features were developed for various portions of the coastal area. These features were combined to form alternative frameworks. Many of the proposed features cannot be combined, while others do not function without other features in place. Also, many features produce more or less benefit--or have higher or lower costs--when combined. These interactions were accounted for when calculating the benefits and costs of each framework.
- In the cost-effectiveness analysis, the frameworks were assessed according to their ability to produce output for a given cost level. Frameworks that maximized output-per-dollar spent were retained, while all other frameworks were eliminated. The result was a list of frameworks that achieve each output level at the lowest cost, or an efficient frontier.
- The cost-effectiveness assessment was followed by incremental cost analysis. Incremental cost is the additional cost for each change in the level of output. Changes in incremental costs, combined with other selection criteria discussed below, facilitated framework selection in the absence of a deterministic rule (such as maximizing net benefits, as is done in National Economic Development (NED) analysis).
- Potential economic impacts of the frameworks were roughly estimated and taken into consideration in project selection as follows: after Cost Effectiveness and Incremental Cost Analysis (CE/ICA), potential economic effects of frameworks in the final array were estimated on a gross basis to inform the PDT of the magnitude of these effects.
- The Institute for Water Resources (IWR)-Plan computer program (Version 3.3, USACE--Institute for Water Resources) was used to automate the CE/ICA. Costs

and benefits were amortized over the 50-year period of analysis at the current Federal discount rate of 5.875 percent. Costs were estimated at the October 2003 price level.

- The CE/ICA used implementation costs (construction and real estate acquisition) measured against ecological benefit output units. The comparison of the coastwide alternatives was based on the sum of subprovince alternative framework ecological benefits versus cost, as provided by the IWR-Plan analysis. The CE/ICA analysis was used to filter the coastwide alternatives down to an array of the most cost-effective frameworks.
- For the development of the final array, cost-effectiveness criteria were also applied. The combined weighted ecological outputs provided by the models and benefit protocols were documented for each coastwide alternative. The combined weighted outputs and costs for each alternative were also displayed and ordered by cost. The primary factors of interest were ecological benefit versus cost, and an assessment of economic effects.

1.1.7 Select Near-Term Alternative (Phase VI)

- Having identified the most efficient, effective, and complete combinations of frameworks in Phase V, the final array of alternative coastwide frameworks was used as the starting point. Development of the restoration features combined into the system frameworks was predominantly based on addressing areas of critical wetland loss, opportunities for the reestablishment of deltaic processes, and the protection and restoration of geomorphic features.
- The system frameworks in the final array identified 79 potential restoration features across the coast from which alternative restoration plans could be developed. The framework formulation process also afforded the USACE and the local sponsor with an iterative process whereby any restoration feature that might be considered critical in nature, by any criteria, could be included and assessed through multiple levels of input.
- The resulting array of alternative coastwide frameworks is therefore viewed to encompass all measures that could possibly be considered as addressing a critical ecological need.
- The LCA VT (Vertical Team) concluded that the intended components would include: features to address near-term critical restoration opportunities that could begin construction within the next 5 to 10 years, demonstration projects to resolve scientific or technical uncertainties, large-scale studies of long-range feature concepts to more fully capture restoration opportunities, and programmatic authority to ensure optimal environmental use of ongoing navigation maintenance material.
- Criteria were then developed to identify which restoration features contained in the final array of coastwide frameworks would be placed into the various component categories.

- The coastal restoration strategies in Louisiana suggest that while these restoration alternatives have significant environmental benefits, they each exhibit weaknesses in addressing the complete range of study planning objectives. One recommended alternative would exhibit long-term sustainability, as the geomorphic structures serve to protect and buffer the diversion feature influence areas from erosive coastal wave action and storm surge. Additionally, river diversion

features would be more sustainable because they would be continuously connected to the river resource and nourished by its sediment and nutrients.

2.0 ESTABLISH PLANNING OBJECTIVES AND EVALUATION CRITERIA (PHASE I)

A Goals and Endpoints Group was developed within the PDT. This group reviewed information from all previous study efforts to identify ecological goals and possible endpoints for potential long-range, large-scale ecosystem restoration strategies. The underlying objectives for the pursuit of these restoration features were the continued productivity and protection of the environment, economy, and the culture of southern Louisiana and their contributions to the national economy. Criteria for identifying appropriate strategies included: resulting overall habitat suitability in the coastal zone; wetland-building potential; ability to assimilate nitrogen and reduce overall contributions to the Gulf of Mexico; and the effect on coastal economic activity. Phase I established two "provinces," the Deltaic Plain and Chenier Plain, within the Louisiana coastal zone for planning purposes. These were further divided into four functional ecological subprovinces.

The LCA has a variety of potential future landscapes, ranging from a landscape where no additional actions are taken to address land loss, to a landscape where extensive large-scale efforts are made to revitalize the coast. Deciding which future landscape to plan for is a complex decision, involving difficult and numerous environmental, social, and economic constraints (or trade-offs). In order to evaluate the improvements to the ecosystem in the context of these various constraints and decide upon a course of action in an ecosystem restoration plan, a variety of options must be reviewed. Thus, a key first step in developing a plan for restoring coastal Louisiana is to define different possible future landscapes (or planning scales) and assess potential alternatives.

Using the planning objectives and the "Comprehensive Study Guiding Principles for Plan Formulation," the PDT defined planning scales to facilitate the development of alternatives. For the purposes of this report, the term "scale" does not refer to a specific state of the landscape. Rather, it reflects the degree to which environmental processes would be restored or reestablished, and the resulting ecosystem and landscape changes that would be expected over the next 50 years. Restoring impaired environmental processes in coastal Louisiana would affect the net rate at which coastal wetlands are lost or gained. Therefore, the planning scales for LCA are expressed in terms of the net rate of landscape loss or gain in coastal Louisiana.

The reference point for the planning scales is the estimate of future net land loss rates under the No Action scenario. For both the Deltaic Plain and Chenier Plain provinces, there are estimates of the annual net loss of wetlands over the next 50 years assuming that no additional restoration efforts (beyond the Coastal Wetland Planning, Protection and Restoration Act (CWPPRA) and other existing programs) are implemented.